UNCERTAINTY AND VARIABILITY IN ESTIMATES OF TOTAL HUMAN EXPOSURE AT HAZARDOUS-WASTES SITES—THE CalTOX PROCESS

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The Department of Toxic Substances Control (DTSC), within the California Environmental Protection Agency, has the responsibility for managing the State's hazardous-waste program to protect public health and the environment. The Office of Scientific Affairs (OSA) within the DTSC provides scientific assistance in the areas of toxicology and risk and environmental assessment. The CalTOX model has been developed as a spreadsheet model to assist in health-risk assessments that address contaminated soils and the contamination of adjacent air, surface water, sediments, and ground water. In this paper we describe ongoing efforts to develop methods and supporting data for linking contaminant sources in multiple environmental media—such as ambient air, ground water, surface water, and soil—to human exposure through multiple routes (inhalation, ingestion, and dermal uptake). These efforts include multimedia transport and transformation models, exposure scenario models, and efforts to quantify uncertainty and variability. Human exposure occurs when contaminants are transferred from these multiple *environmental* media to human *exposure* media—personal air, tap water, household soil, food products, etc. Using the CalTOX approach as an example, we consider how multimedia transport and multiple pathway exposures can be incorporated into a comprehensive exposure/risk assessment and how precise and reliable are the predictions of these types of models. We examine the delicate balance between scientific defensibility (which favors large complex models with big data bases) and utility for policy makers (which favors simple, flexible, easy-to-used models) and a flexible approach for striking this balance.

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